Measuring the Digital Economy



Erich H. Strassner

BEA Advisory Committee

November 18, 2016

Overview



The "digital economy" has various meanings. This presentation will focus on three specific measurement challenges for national accounts:

- Measurement of the price and volume of "digital" goods and services in quality-adjusted terms
- New "digital" services such as ride-sharing and other aspects of the "sharing economy"
- "Free" Internet services that are supported by advertising

SNA 2008 on quality-adjusted prices



SNA 2008 15.56–57:

Price and volume indices are compiled by comparing the prices or quantities of goods of the same characteristics or quality (that is homogenous goods) over time. This is not easy in product areas such as personal computers where quality changes rapidly.

Chaining helps ameliorate the problems of such constant quality comparisons...

15.83:

A more general and powerful method of dealing with changes in quality is to make use of estimates from **hedonic regression equations**. Hedonic regression equations relate the observed market prices of different models to certain measurable pricedetermining characteristics.

Quality adjustment in U.S. accounts



- A 1980s collaboration between IBM and BEA led to the introduction of first quality-adjusted prices for computers in the U.S. national accounts:
 - Cole, et al (1986) "Quality Adjusted Price Indexes for Computer Processors and Selected Peripheral Equipment" Survey of Current Business
- Subsequent work by BEA, Bureau of Labor Statistics and Federal Reserve Board led to quality-adjusted prices for semiconductors, local-area network equipment, photocopy equipment, other communication equipment, etc.
- Nevertheless, gaps remain.

Recent changes in digital economy



- Decreasing share of traditional desktop, laptop computers
- Growing importance of mobile equipment and services
 - Smartphones, tablets, wireless data service, wifi
- Growing importance of computing services
 - "Cloud" services, distributed computing
- Growing importance of other "tech" equipment:
 - Communications equipment, electro-medical equipment, instruments

A digital economy satellite account



- BEA recently began work on a project to develop tools and techniques to better measure the digital economy and to further capture technology's role in economic growth.
 - Partly supported through a reimbursable agreement with the National Telecommunications and Information Administration
- Strategies include:
 - Define the digital economy and capture its contribution to growth
 - Improve measures of high-tech goods and services
 - Update and improve information on digital economy
 - Provide more complete picture of international trade
 - Provide more information on e-commerce

Work on improving price indexes



- In foundational work toward a digital economy satellite account, BEA is planning projects to improve or introduce quality adjustments for several price indexes:
 - Software
 - Enterprise
 - Custom/Inhouse
 - Consumer
 - Personal computers
 - Servers
 - Cloud services
 - Medical equipment / Imaging equipment

Quality-adjusted prices: Smartphones



- When smartphones were introduced, they provided functionality that previously had been provided by several separate goods:
 - Mobile telephone
 - Digital camera
 - GPS navigation device
 - Portable media player (MP3 player or iPod), etc.
- Price indexes are designed to compare prices within a single category – problematic to link several categories to one
- At this point, unclear whether there is a good strategy for dealing with this problem

Sharing economy



- Internet provides a platform for sharing information and collaborating
- New category of firms that use Internet and information technology for "digital matching"
 - Use IT systems on web/mobile apps to facilitate peer-to-peer transactions
 - Rely on user-based rating systems for quality control
 - Offer workers flexibility in deciding working hours
 - Rely on workers to use their own tools/assets
 - Telles (2016) "<u>Digital Matching Firms: A New Definition in the 'Sharing Economy' Space</u>" U.S. Department of Commerce
- Transportation (Uber/Lyft), Lodging (AirBnB), etc.

Sharing economy in U.S. statistics



- Considerable interest in whether/how activities are measured
- Firms appear to be included in business registers and surveys
 - Captured by administrative/tax data used to create business registers
- Workers are often "independent contractors" rather than employees
 - Income classified as proprietors' income
 - Income reported to tax authorities, but well-known problems of underreporting that may require adjustments

Sharing economy: Prices and volume



Price/volume measurement?

- When new firms enter an activity, price indexes generally don't directly compare price of new entrants with incumbents
- If prices offered by entrants are lower, could lead to biased price/volume measures
- Equivalent to "new outlet bias" described in Consumer
 Price Index Manual: Theory and Practice (11.62):

...when a new outlet enters the sample there are no standard procedures for comparing data at the new and old outlets.

How big is the sharing economy?



- U.S. official statistics can't currently answer this question:
 - Classification systems do not separately identify these firms/workers
 - For industries with a single large "sharing" firm, data would be restricted by nondisclosure rules
- Estimates from other sources:
 - Katz and Krueger (2016) found that workers providing services through online intermediaries accounted for 0.5% of all workers in 2015

"Free" advertising-supported media



- Many Internet services do not involve direct payment of fees by users, but rather are funded by advertising.
 - Google search, Facebook, Instagram, etc.
- SNA 2008 treats the output of these service providers as intermediate consumption of the unit that pays for the advertising.
- Consumers, however, undoubtedly value these services and would be willing to pay for them.
- Economists argue that the value to consumers is "missing" in household final consumption expenditures/GDP
 - Experimental research ongoing in this area; e.g., Nakamura, Samuels and Soloveichik (2016) "<u>Valuing 'Free' Media in GDP: An Experimental Approach</u>" Bureau of Economic Analysis

Conclusion and Next Steps



- Measurement of the digital economy remains a priority area for BEA
 - Define the digital economy and capture its contribution to growth
 - Improve measures of high-tech goods and services
 - Update and improve information on digital economy
- Pleased with our partnership with NTIA
- Look forward to collaborations with our partners in statistical system and with expert community